Exercise 1.1

1. **Is zero a rational number? Can you write it in the form $\frac{p}{q}$ where p and q are integers and $q \neq 0$?**

Solution:

We know that, a number is said to be rational if it can be written in the form $\frac{p}{q}$, where p and q are integers and q≠0.

Taking the case of '0',

Zero can be written in the form $\frac{0}{1}, \frac{0}{2}, \frac{0}{3}$… as well as, $\frac{0}{-1}, \frac{0}{-2}, \frac{0}{-3}$…

Since it satisfies the necessary condition, we can conclude that 0 can be written in the $\frac{p}{q}$ form, where q can either be positive or negative number.

Hence, 0 is a rational number.

2. **Find six rational numbers between 3 and 4.**

Solution:

There are infinite rational numbers between 3 and 4.

As we have to find 6 rational numbers between 3 and 4, we will multiply both the numbers, 3 and 4, with 6+1=7 (or any number greater than 6)

i.e., $3 \times \frac{7}{7} = \frac{21}{7}$

and, $4 \times \frac{7}{7} = \frac{28}{7}$

∴The numbers in between $\frac{21}{7}$ and $\frac{28}{7}$ will be rational and will fall between 3 and 4.

Hence, $\frac{22}{7}, \frac{23}{7}, \frac{24}{7}, \frac{25}{7}, \frac{26}{7}, \frac{27}{7}$ are the 6 rational numbers between 3 and 4.

3. **Find five rational numbers between $\frac{3}{5}$ and $\frac{4}{5}$.**

Solution:

There are infinite rational numbers between $\frac{3}{5}$ and $\frac{4}{5}$.

To find out 5 rational numbers between $\frac{3}{5}$ and $\frac{4}{5}$, we will multiply both the numbers, $\frac{3}{5}$ and $\frac{4}{5}$, with 5+1=6 (or any number greater than 5)

i.e., $\frac{3}{5} \times \frac{6}{6} = \frac{18}{30}$

and, $\frac{4}{5} \times \frac{6}{6} = \frac{24}{30}$

∴The numbers in between $\frac{18}{30}$ and $\frac{24}{30}$ will be rational and will fall between $\frac{3}{5}$ and $\frac{4}{5}$.

Hence, $\frac{19}{30}, \frac{20}{30}, \frac{21}{30}, \frac{22}{30}, \frac{23}{30}$ are the 5 rational numbers between $\frac{3}{5}$ and $\frac{4}{5}$.

4. **State whether the following statements are true or false. Give reasons for your answers.**

(i) Every natural number is a whole number.
Solution:
True
Natural numbers- Numbers starting from 1 to infinity (without fractions or decimals)
i.e., Natural numbers= 1,2,3,4…
Whole numbers- Numbers starting from 0 to infinity (without fractions or decimals)
i.e., Whole numbers= 0,1,2,3…
Or, we can say that whole numbers have all the elements of natural numbers and zero.
∴ Every natural number is a whole number, however, every whole number is not a natural number.

(ii) Every integer is a whole number.
Solution:
False
Integers- Integers are set of numbers that contain positive, negative and 0; excluding fractional and decimal numbers.
i.e., integers= {…-4,-3,-2,-1,0,1,2,3,4…}
Whole numbers- Numbers starting from 0 to infinity (without fractions or decimals)
i.e., Whole numbers= 0,1,2,3….
Hence, we can say that integers includes whole numbers as well as negative numbers.
∴ Every whole number is an integer, however, every integer is not a whole number.

(iii) Every rational number is a whole number.
Solution:
False
Rational numbers- All numbers in the form $\frac{p}{q}$, where p and q are integers and q≠0.
i.e., Rational numbers= $0,\frac{19}{30},2, \frac{9}{-3}, \frac{-12}{7}$…
Whole numbers- Numbers starting from 0 to infinity (without fractions or decimals)
i.e., Whole numbers= 0,1,2,3….
Hence, we can say that integers includes whole numbers as well as negative numbers.
∴ Every whole numbers are rational, however, every rational numbers are not whole numbers.